In the first line of p. 22 "position" is obviously a misprint for "composition," and there are a considerable number of such slips throughout the work.

A fairly full "contents list" is given, but the book would have been more useful if a comprehensive index had been provided. T. A. H.

THE WORKS OF C. F. GAUSS.

Carl Friedrich Gauss Werke. Siebenter Band. Herausgegeben von der Kön. Gesellschaft der Wissenschaften zu Göttingen. Pp. 650. (Leipzig: B. G. Teubner, 1906.) Price 30 marks.

THIS volume contains a reprint of Gauss's principal astronomical work, the "Theoria Motus Corporum Cœlestium," and his unpublished researches on planetary perturbations and on the lunar theory. In 1871 the late Prof. Schering brought out a "volume vii." without the cooperation of the Göttingen Academy of Science, containing the "Theoria Motus" and some notes from Gauss's papers; but for the sake of uniformity the academy considered it desirable to include the "Theoria" in the present volume, which has been edited by Prof. Brendel, of Göttingen.

A careful revision of the original edition of 1809 brought a few corrections to light, and a re-computation of the examples with modern tables of logarithms revealed a number of errors of one or two units of the seventh decimal (caused probably by the absence of decimals in the proportional parts of the old tables) which sometimes gave rise to greater errors in the course of the computation. A list of these corrections is given. Some notes found in Gauss's own copy of the book are added in footnotes. Next follow various notes on elliptic and parabolic motion, partly already published, partly extracted from letters and note-books. Of these the most important is a table for computing the true anomaly in a parabolic orbit; it was to have formed part of a supplement to the "Theoria Motus," dealing with the orbits of comets, which never was written.

The discovery of the first of the minor planets, Ceres, had obliged Gauss to work out a general method of computing an elliptic orbit. The next step was to determine the perturbations of the motion of Ceres and Pallas, which, particularly in the case of the latter, necessitated new methods owing to the great eccentricity and inclination; and on this work Gauss spent a great deal of time in the years 1802 to 1817. In 1805 he worked out a new method of computing the general perturbations by the variation of the elements, but he never published anything on the subject. The method is essentially the same as that proposed by Hansen in 1843 in his paper on absolute perturbations in orbits of any eccentricity and inclination.

The present volume first gives letters and computations on Ceres, after which follow 200 pages devoted to Pallas. Special perturbations by Jupiter for the years 1803–1811 were computed in 1810 and 1811, first for intervals of fifty days, after which the work was repeated with periods of 500 days, the elements for each period being taken from the first computation. The memoir on the theory of general perturbations was written in French, about the year 1815, apparently in answer to a prize question of the Paris Academy, but never finished. In 1811 Gauss began the immense labour of computing the action of Jupiter on Pallas, and finally, with the aid of Encke and Westphal, completed the work by the preparation of tables. The perturbations by Saturn were computed by Nicolai, and this work is preserved at the Heidelberg Observatory; it has naturally not been included in the present volume, but hopes are held out that it may be published elsewhere. Finally, the last part of the whole work, the action of Mars, was taken in hand, but owing to the press of other work it was never completed. It is much to be regretted that this fine piece of work, involving an enormous amount of computation, has been unknown until now, and that not even so interesting a result as the increase of the assumed mass of Jupiter was published. Already in 1814 Gauss found from the first nine oppositions of Pallas that Laplace's value, 1 : 1067·09, should be increased to 1 : 1042·86, a result which differs but little from the most recent determinations. If known to Encke, this correction of the mass would have prevented the errors of 5′ in the computed geocentric places in 1834, caused by the near approach to Jupiter in 1832 (*Astr. Nachr.*, No. 332). Needless to say, the remarkable commensurability of the mean motions of Jupiter and Pallas was noticed by Gauss at an early date.

It appears from letters written to Hansen and Bessel in 1843 that Gauss bitterly regretted having laid this great work aside. Thanks to the skilful editorship of Prof. Brendel, whose task of arranging and interpreting a vast mass of papers must have been a very difficult one, the work is now accessible in a clear and convenient form, and it is to be hoped that some competent hand will complete it.

Lastly, the volume contains the beginning of a lunar theory, dating from the second half of 1801, but soon abandoned, probably because vol. iii. of Laplace's "Mécanique Céleste" came out in the following year, and seemed to make work on the motion of the moon unnecessary at that moment. The form in which the perturbations are given is similar to that of Plana (1832).

Vols. viii. and ix. of the collected works of Gauss have already appeared. A tenth and concluding volume is announced, which is to include a general index. J. L. E. D.

NATURE AND FLORAL DESIGN.

Flowers and Plants for Designers and Schools. By Henry Irving and E. F. Strange. Pp. 95. (London: Hodder and Stoughton, 1907.) Price 10*s.* 6*d.* net.

IF designers could be produced by the study of books upon plant form there ought to be a large and flourishing crop of them, since so many elaborate works have appeared on this subject addressed to the supposed needs of such artists.